

# 6502

# Z80

*Spectrum / CPC /  
BBC / MSX / Oric /  
Acorn / QL / Jupiter  
Ace / Vic-20 / PCW &  
PcW16 / SAM Coupe /  
Commodore 64-128D*

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publication for the  
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**Apr 99  
Issue  
#0  
RRP  
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*Inside: Intro to Z80 & CP/M, Discs & Drives, BBC BASIC  
programming, CPC hardware project, News, Bargains*





# CONTENTS....



## Editorial bit

01788 817473 weekdays 7-9pm

Welcome to the very first issue of "650-z80" - the general 8 bit computer magazine for enthusiasts of these old micros. I hope you like this first issue and that you will want to stay with us on our adventure to bring you the best in articles and technical support.

As you will see from this issue, many articles are designed to be suitable for more than one computer e.g. "Discs & Drives", "Classic Add-ons" & "Intro to CPM".

All Z80 micros are covered with our series on Z80 machine code, plus we have a series on Basic projects for all computers using the 6502 processor. In addition to this are various news items and adverts. Next issue I hope to increase the page count to 40 and any ideas for the group are welcomed - Martyn, Editor.

## Regular columns

- page 2: The Editor's comments
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UNITED AMSTRAD  
USER GROUP



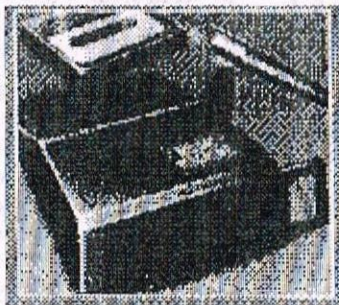
# ..Booting up...

## SPECIAL FEATURE

Prism PD member 'Arcadia' starts his series on disc drives and discs for 3" disc users. This will be of interest to any computer system using these drives as the drives and discs are the same. So boot up for a great read!

## CLASSIC ADD-ON

Step back in time with an article on one of the classic hardware pieces of our time - the RAM Music Machine by Datel Electronics. A perfect guide for the second hand market buyer.



The 8 BIT's leading Midi interface package.

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Club magazine offering excellent value for money with free cover disc or tape, filled with software from Prism PD (Speccy/CPC). Internet book search. Customer support. Bargain buys from club members. Discounts. Years of expert 6502 & Z80 knowledge. Regular Club competitions offering great prizes. Forget the rest and join the best!



# ADVERTS

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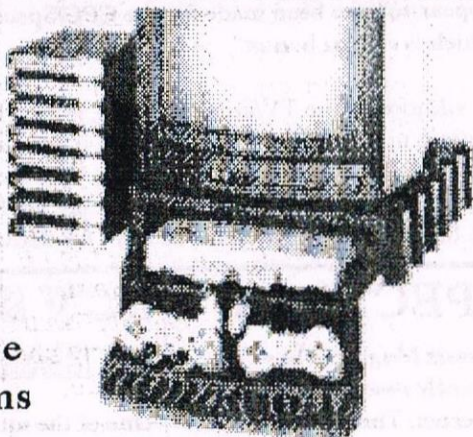
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# 8 BIT Micro news



## New 8bit hardware for monitor systems

Just when you thought that there was no new hardware for your 8 bit, a new product has been made even though the 8 bit was not in the thoughts of the creators. The piece of kit is a TV/Monitor stand called the Space Station. It was actually designed for the Playstation as a combined storage unit and TV/Monitor stand. Your editor has bought one and here are his thoughts on it:

"The Space Station is a black stand moulded in tough plastic. A drawer slides out which is used to house the Playstation. The pleasing aspect of this stand is the design which perfectly matches the complete range of CPC/Speccy computers but is suitable for all 8 bit systems. I'm currently using it with my 6128 and 464 monitor. Because the stand is not as wide as the 6128, I have it positioned behind the computer so that my add-ons can rest underneath it. I also have both a 3" disc drive and Freddy Drive attached to the right of the stand behind the 6128 with the cables being fed underneath the stand. This provides the flexibility to deal with various orders and enquiries and I only have to change to a 464 when tape orders have to be processed.

In order to house my Playstation, I have the drawer section hanging over the back of my desk in order to provide enough room for add-ons to sit under the stand. It works extremely well and the design makes it

Latest news on the computer scene



# More snippets..

appear to have been made for the CPC/Specy as a complete unit which is a great bonus."

In addition to the TV/monitor stand, is a FREE CD rack which can contain up to 16 CD's or 8 Playstation games. These stands can be purchased from the United Amstrad User Group for the price of £32 which includes postage and packing via Parcelforce. Payment to 'M Sherwood'. Please allow 28 days for delivery.

## SPECTRUM

Classix Magazine has recently resurfaced on the Internet. The retro magazine had enjoyed a few years of success, but its editor, James Waddington decided to cease publication due to University commitments. He is now producing an Internet version of the mag, and it still contains all the usual retro fun.

Andy Ryals in Wakefield has started a new spectrum publication called "Hackers Hangout". It costs £1 and contains loads of pokes, cheats, hacks which are all his own work. He also includes some items such as letters, for sale etc. If you are interested in obtaining a copy then please write to: 29 Dent Drive, Wakefield, W Yorks, WF1 4JG

## PCW SCENE TAKES A HAMMER BLOW

One of the most respected magazines for the PCW has suddenly ceased trading. The editor of "PCW Plus" decided to call it a day. This is no doubt partly due to dwindling support for the general 8 bit scene, and in turn a lack of new articles.

Another sad exit was the newsletter of the South Devon PCW club. The club decided to cease publishing it due to lack of new material.

However all is not lost because PCW users can still subscribe to the excellent fanzine of the British Amstrad PCW Users Group. The magazine is of a high standard including card for the front cover. Printing is clear and the articles are very informative. For those who wish to see a copy contact the group at : David Lalieu, Club Secretary, 10 Sheridan Avenue, Benfleet, Essex SS71RD



# Sad SAM news

## New printer for PC/CPC/Spectrum+2a & +3 users.

Canon have released a portable printer called the BJC80. It uses new print technology, can be run from mains or battery and use low cost b/w or colour ink tanks. PC users have the benefit of a set-up utility program, but program listings can be obtained from CPC & Spectrum Basic using Epson modes.

## **SAM ICON DIES**

News report by  
the Editor

Just after my Spectrum / SAM magazine was distributed, one of our members up North phoned me with some shocking news. Malcolm MacKenzie of Persona Software had died of a heart attack at the age of 52. This happened just prior to the Northern Spectrum SAM Show held at Wetherby - and out of respect the show was cancelled. This is the type of news that no one enjoys writing up about, and our heartfelt thoughts go out to his wife Donna, and family. I had the pleasure of speaking to Malcolm a few times on the phone and had learnt a lot about

him. His vision & ideas had done more than most to promote the Coupe with software such as: Burglar Bob, Ice Chicken, blitz Mag and the Atom hard drive interface. Malcolm MacKenzie 1946-1999

## **Poor Response**

The response by Brian Watsons 8 BIT readers to the new "6502/780" magazine has been poor. Only 4 of his readers have sent a subscription out of an 800 readership. Despite this, the new magazine has been picking up readers from other sources of advertising and will at least have the first year guaranteed. Articles for the CBM64, PCW, Z88 are required. This will earn you free copies.

## **CRASHED #23 OUT NOW**

The Spectrum fanzine "CRASHED" #23 has just recently been released. Dave has improved the print quality for his second issue in charge, and the general layout is much better, with the design resembling PD Power of yesteryear. The new issue contains retro reviews, a news page, a look at the Euro scene, an interview with former Softsell owner Joyce Cook, and a rundown of latest demo releases, letters and the Sinclair Years part 2. Warning: the magazine tends to contain a lot of vulgarity. Cost is £1 (cash only) to 11 Camel Rd, London E16 2DE.



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## **CPC BOOK SALE**

**The following book packs are available from the Editor.**

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**(2) Entertainment:** Computer Challenges For The Amstrad / Amstrad Graphics - User Guide / The Punter's Revenge / Sensational Games for CPC464 / Amstrad Pentacle Adventure Creator

**(3) Programming:** Beginners Guide To Basic / Teach Yourself Basic / Teach Yourself Fortran / Pascal Programming / Big Red Book of C / Powerful Programming / Programming Made Simple / Crash Course In Pascal / Programming on The 464-664-6128 / Making Basic Work For You / Introduction To C / Advanced Programming Techniques for 464 / 60 Programs For 464

**(4) Manuals:** Amstrad Memory Guide / Programmers Guide / Mastering M/C On Your 464-664-6128 / Ins & Outs Of The Amstrad / Disc Companion / Amstrad Computing / Amstrad Advanced Users Guide / M/C For The Beginner / Spare 464 User Manual

**COST:** Each pack is £29 payable to "M Sherwood" at the UAUG add'.



# CPC Workshop

## **HARDWARE PROJECT: a CPC thermometer**

This project may be used indoors to measure room temperature or temperatures of photographic solutions. It could even be used as part of a fire alarm system to detect excessive heat.

### **How it works**

The variable resistor used in this circuit diagram (fig 1.1) is known as a thermistor. Its also known as a negative temperature coefficient. Over its usual working range its resistance decreases as its temperature increases. An increase in temperature means a fall in the resistance of the thermistor - resulting in a fall in potential at point A and a falling analogue voltage at the input of IC2. The waveform of the output of IC2 changes, and this change can be measured by the CPC.

### **Building it**

Normally the thermistor is located outdoors. For use in weather recordings, the best place is inside a meteorological screen. This shades it from direct sunlight yet allows air to circulate freely around it. Otherwise place away

from direct sunlight with good air flow should suffice. Ensure it is placed several centimetres away from any surface or its readings will be inaccurate. If placed in the open, protect it from the rain or you risk a short circuit.

One method of water proofing is to melt some paraffin wax and dip the thermometer in it - or you could coat it with a quantity of epoxy resin adhesive.

The rest of the circuit is built in a small case, located close to the micro. It needs two wires to connect it to the micro: the ground line and a wire to the Data Input.

When the circuit is ready you test for short circuits between the lines that are to be connected to the micro. you can then try the effects of various temperatures by immersing the thermistor in warm water or in water containing melting ice cubes. In such extremes the output of IC2 should never be continuously 'high' or 'low' but if it is then replace R3 by resistor of different value - or wire an additional resistor between R4 and the 0v line.

Calibration and programming



# thermometer

A good method of programming is to read the value of the output many times and count the 'high's obtained. This is referred to as the 'sampling method and a program to carry this out is thus:

```
10 X=3
20 FOR J=1 TO 500
30 IF JOY(0) > 0 THEN X=X+1
40 NEXT
50 PRINT X
60 GOTO 10
```

Having obtained a value  $x$  which varies in proportion to temperature, the next step is to calibrate the thermometer. Place the thermistor in a glass of water + melting ice cubes. Stir occasionally and allow 5 minutes for the thermistor to take up the temperature of the water (should be about 0C (32F)).

Run the program several times to find an average value for  $x$ . Results should be within 20 to 50. If the count is below, the thermistor needs further cooling. Replace the cubes if necessary. Now repeat the process but with a glass of warm water (30C or 90F). Choose a temperature above the upper end of the range

required for measuring - readings should be over 300 at least.

Suppose reading 1 was at 0C and the second at TC - the formula for converting the reading  $x$  at any temperature is:

$$t = (x - x_1) \times \frac{T}{x_2 - x_1}$$

For example, if the count is 40 at 0C and 420 at 30C then a count of 150 is equivalent to a temperature of:

$$t = (150 - 40) \times \frac{30}{420 - 40} \\ = 90 \times 30 / 380 = 7.1^\circ\text{C}$$

The same formula can be used on the Fahrenheit scale except



# Diagram >>>

that having contentiously calculated, you add 32 degrees to it. In a program using the above values the formula would be:

$$60 = (x - 40) * 30 / 380$$

Readings can be obtained in a given moment or on regular intervals. The CPC could be used to print out tables of daily temperature readings and patterns of weather conditions could be built up over time.

#### Parts required

Resistors (carbon, 0.25W, 5% tolerance):

R1 220k

R2, R5 100k (2 of)

R3 56k

R4 VA1056S rod thermistor, or any negative temperature coefficient thermistor having resistance about 47k at 25C (disc and bead types equally suitable).

#### Capacitor:

C1 47n polyester

#### Integrated circuits:

IC1 CD4011 CMOS quadruple

2-input NAND gate

IC2 555C voltage-to-time converter

#### Miscellaneous:

Suitable housing for thermistor

Case for circuit

Circuit board

1mm terminal pins (5 of)

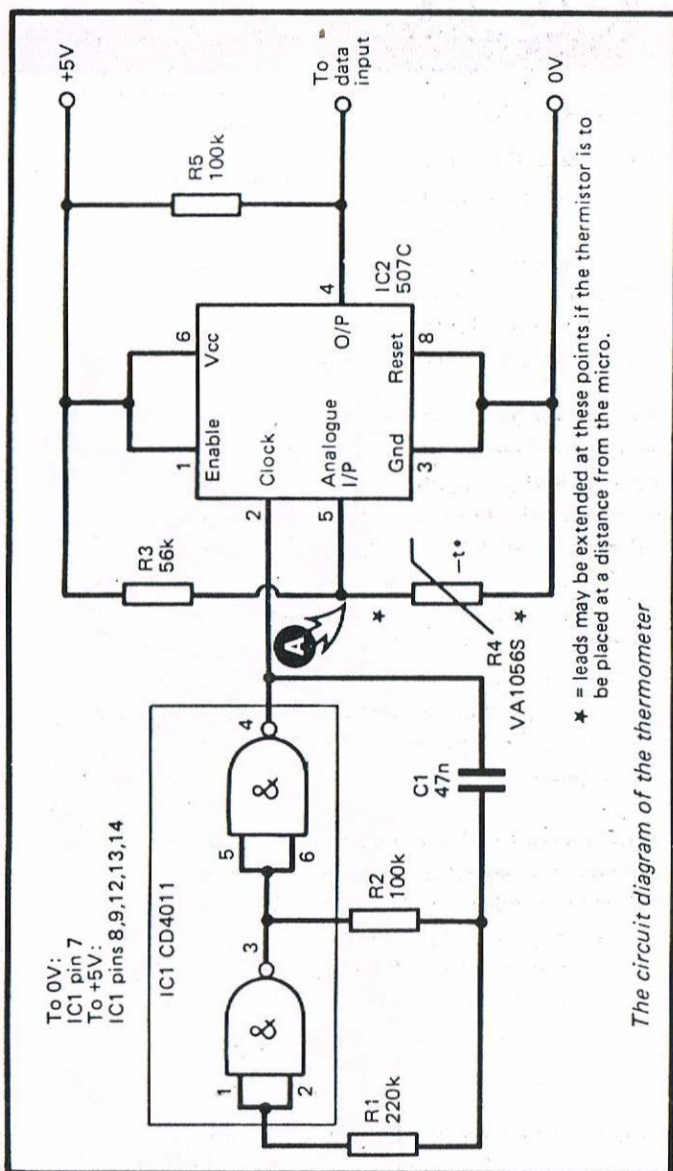
8-pin IC socket

14-pin IC socket

Connector for Joystick port  
connecting wire









# Special Feature

## Discs and drives part 1 By 'Arcadia' of Prism PD

**FOR ALL 8 BITS WITH 3"  
DISC DRIVES**

All computers need some form of storage for programs and data which will enable them to be kept when the computer is turned off. With the exception of some portable computers with RAM backed up by batteries, all contents of memory is lost when the micro is switched off. Some modern computers like the PC and Amiga A1200 use special RAM which retains data during a warm reset - but for our 8 bit micros we need hardware solutions.

Early micros like the C64, MSX, 464, ZX81, Spectrum etc had cassette recorders either built in or plugged into ear/mic sockets. This had the advantage of being inexpensive but it also had two problems. Firstly both recording and loading of data was slow because of the limited quality of the signal that could be recorded. The second problem was reliability. Not all cassette recorders would work with all computers - and some computers hated external cassette players! Something had to be done and by the mid 80's special data recorders were introduced, some built into the computer. These had special equalisation and phasing controls to produce signals more suited to computer use. Examples are the 464, Spectrum +2, C64 datacorder, the Spectrum's external 'SPRINT' datacorder and so on. The external ones were quite expensive and still didn't overcome the problems caused by slow tape speed.

This encouraged the use of the disc drive. They are fast, reliable but the drives were even more expensive - sometimes costing more than the computer itself! A good example is the Commodore 1541 5.25" disc drive. But gradually prices came down and then computers started appearing with built in drives such as the 6128 and the Commodore 64/128D. Home computers with built in disc drives were the way forward by 1985 and having one meant success - such as the Amiga range. Even the Spectrum +3 appeared, but its reliability never matched that of the 6128.

To understand why discs are fast you need to know how they work. A disc is made of a plastic material coated on both sides with a magnetic layer - very similar to that of tapes. The disc is enclosed inside an outer casing called the diskette. Some early 3.5" discs were sold as single sided because one side did not

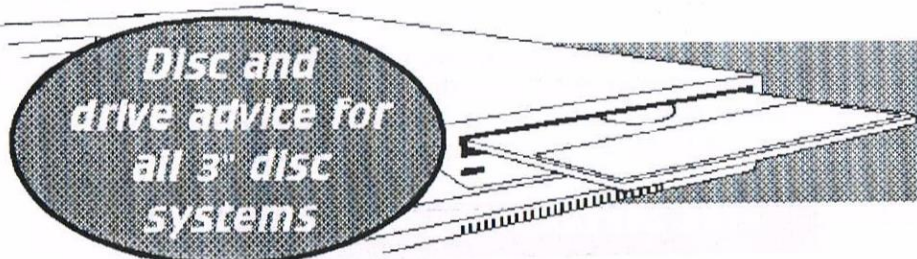


pass the inspection tests of the manufacturer. All 3" discs were sold as double sided but because the disc needs to be flipped over to use the other side, they were also known as 'single-sided reversible' discs. This was to distinguish them from PCW8256 3" discs were drives on these computers had two sets of heads.

The term floppy disc arose because of the old 5.25" discs which could be bent and to distinguish them from the Winchester hard drives on PC's when they first appeared. Modern discs are quite rigid, and are held firmly in place when being accessed via centrifugal force due to the high speeds that they spin at. Data on floppies is recorded on to tracks which are formed in concentric circles. The read write head can step quite quickly from track to track. discs for the CPC and +3 use the 40 track system, while on PCW's it is 80 tracks. Each of these tracks are divided into 9 sectors with 360 sectors in total and due to the speed of the heads and disc rotation, information can be accessed quickly. Each of these sectors can store half a kilobyte (512 bytes) which gives maximum of 180k. However it does depend on the computers operating system as to what standard formatting capacity is achieved, but programmers have since come up with a means of increasing disc space.

Because of all these factors governing how data is stored on discs, it is regarded as a 'random access' medium as opposed to tape which is classed as 'serial access' medium. There is one section on every disc called a directory which stores information on the layout of tracks and sectors and data contained. This directory is always updated whenever new files are saved or old ones removed. That is why it is important to use file recovery programs before saving new data, if you want to bring back files that were deleted by mistake. Deleted files remain on the disc - it is only the directory entry that has been removed allowing space occupied by unwanted files to be 'overwritten'. The directory allows the computer to move around files on a disc quickly and to find available space and to check the space is large enough for continued use. The creation and maintenance of the directory is automatic and needs no specific action by the user.

Next issue: disc care & avoiding some of the pitfalls.





# Intro to CP/M

by Martyn Sherwood

## For any computer system using CP/M.

This is the start of a long running series on CP/M. We'll start with the basics and progress onto more technical aspects.

CP/M is a general purpose operating system and the programs written for it are done so under machine code. But in order to understand what CP/M is all about and what makes it so useful it is best to consider operating systems in general.

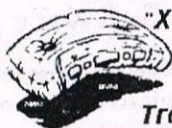
all computers have some form of built in operating system no matter how crude and without one all computers would be

totally useless. This operating system is contained in the ROM (Read Only Memory) of your computer. Amiga's call it Kickstart, PC's call it the BIOS, while for 8 bits there is no particular name given to it other than the processor used by that computer. The information on ROM chips can only be read by the system and cannot be altered. ROM chips are also known as "Non-Volatile" because the contents remain intact when the computer is switched off.

With a lot of 8 bits, the operating system (OS) does little more than perform simple setting up routines and then hand control over to a BASIC interpreter or some other programming language - in other cases  
*continues on page 18*

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# GHOST IN THE MACHINE

## GAZZA II - © Empire 1990

Mars bars, clown suits, donar kebabs, pints of lager, practical jokes, confrontations with Vinny Jones - all this and Gazza still found time to play football! Gazza II couldn't fail to improve upon the awful first game. This was overhead with large colourful sprites and fast game play. A variety of options such as: 40 top teams, formations, league settings, and various factors from wind speeds, tactics, to individual player characteristics made it the best arcade football game of 1990. The game itself was hard



to master - but once done, a lot of frenzied activity was the outcome. This depended on remembering all the different movements depicted by the joystick positions - further more, would your joystick last a 90 minutes? (!). Overall a great football game for fans of arcade action which still looks good.

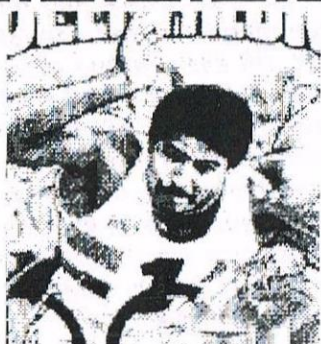
## Daley Thompson's Decathlon

© Ocean Software 1985

Without doubt, Daley Thompson is one of the greatest of British athletes of all time.

Olympic and World champion - the opposition were put in the shade, just like other sport sims in 1985 when this hit the shelves. Your task was to control the animation of Daley through 10 events. The only real trouble with this type of game was the game control. You almost had to become

# CLASSIC 8



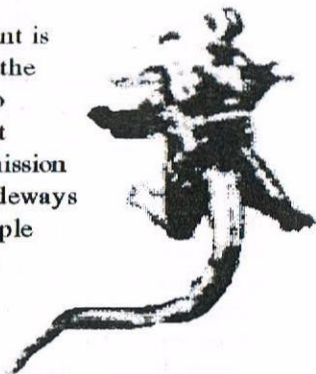
a decathlete in order to progress in the game - much like the successor - "Daley Thompson's Olympic Challenge". Each event needed a lot of practice to master the moves of Daley as he sprinted, jumped and threw his way to a gold medal (provided your hands & joystick could take the punishment!).



## AQUANAUT - © Power House 1988

Something's stirring in the ocean depths, and its intent is the destruction of mankind. The aliens are polluting the seas, causing the elements of the sea to mutate into terrifying creatures. Enter the Aquanaut, the most advanced under sea vessel, with you in charge, your mission is to rid the seas of these creatures. The game is a sideways scrolling, multicolour blast fest. The plot may be simple but a lot of fun can be had. All the basic sound effects are present and the graphics are quite atmospheric.

One to look out for.



## STRIDER - © Capcom USA, Inc 1989

In the days of the cold war, you could always expect a few computer games

# BIT SOFTWARE

with political overtones. Russia was usually the target and this game is no different. Infiltrating the land of the big bear was the mission here - to find enemy secret papers amongst the Red Army. The game starts off in Red Square where you battled against the enemy in a Street Fighter II style environment. Then the story moves on to Siberia - fighting Russia's best. If after all these tests you manage to survive, you must summon one last ounce of determination to defeat Russia's Grand Master of the Red Army. The game play is fast and furious, even if the graphics are a little below par. Easy it aint, and unless you have stickability, some may fall tired of this game. Quite good



fun could be had though, to pass away a few hours.



control is handed over to a high level language at switch on. The whole purpose of the OS is to ensure various elements of the hardware work together as a self contained unit. Where a computer has a complex OS this can be advantageous when running a program or another language. For example, the program can then use the built in routine to scan the keyboard instead of providing its own. A full OS will offer routines to control all the peripheral elements in a system making it easy to write data to the monitor screen, read it from a serial port etc.

In an ideal world all the computers ever made would have been compatible - but that of course is just a pipe dream. Each system has its own OS, hardware configurations, electronics and so on. The nearest anyone has come to achieving this is Digital Research when they wrote "CP/M" (Control Program for Microcomputers). The idea was to provide a standard OS no matter what computer was in use. This would ensure (within limits) that a program written under CP/M on one computer, could be run on another different computer altogether. Of course it has to be said that CP/M for each computer type is different as it needs to address the particular memory addresses and hardware configurations of the computer it is running on.

The limitations of CP/M compatibility between different micros is still an overriding factor. If a CP/M program delves too far into one machine types configuration such as memory capacity, and your computer has less memory, then the program in question isn't going to run. Even with CP/M running CPC CP/M programs on a Spectrum can be a hit or miss affair. Running CP/M software from a CPC on a C64 is not likely to succeed, because the CPC's default disc was the 3"

type while for the C64 it was 5.25.

CP/M is often referred to as a "disc operating system" which has led to some misconception that it is only concerned with the drives on system. While the centre of activity revolves around the discs when transferring software between different computer types, CP/M control all aspects of a computer. Also, CP/M is loaded up from disc by the user instead of having it on ROM as part of the integral computer OS.

Over the years, various versions of CP/M have been released to keep pace with changing technology. At the beginning a computer with twin drives and 64k of RAM was generally regarded as an expensive business system. These days of course, such systems are only used by the computer enthusiast who likes tinkering around with old technology. With PC's dominating the computer market and Windows 95/98 being the standard OS, CP/M will probably always be regarded as a thing of the past.

The most common forms of CP/M were versions 2.2 and 3.0 (also known as CP/M Plus). Version 2.2 was designed for use with computers that only addressed 64k of RAM. CP/M Plus came out when 128k computers appeared whereby extra banks could be addressed due to built in memory bank switching routines. Version 2.2 can still be used on 128k micros, but will not fully utilize the computers system. CP/M Plus on the other hand, will only run on computers that support memory bank switching to address 128k RAM.

Next issue: Discs/drives/disc sizes.



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*Eds note: they have not supplied 3.5 drive  
kits for over three years contrary to some  
ads in other magazines*

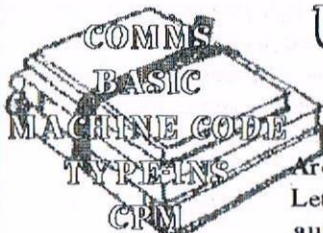
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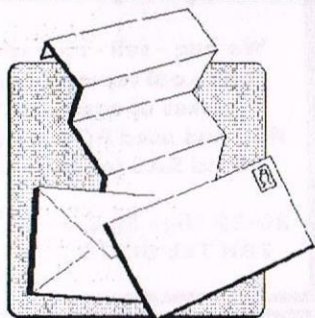
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# Readers Letters

Dear Martyn

I enclose a cheque for £3 for the introductory issue of "6502-z802. The "Beebug" magazine that supported BBC computers ceased publication some years ago so your new venture will be most welcomed. I hope to find something for the Beebs but realise you are trying to satisfy a wide range of 8-bit machines so I will decide after seeing the April issue. I am uncertain whether you intend to supply data or programs etc with the magazine or to make programmed discs available as an extra service.



Yours sincerely - Brian Parnell

Ed. The original intention was to supply tapes/discs with each issue containing programs (utilities, games, applications). As I can only personally copy software for the Spectrum, CPC, C64 & Oric a final decision will be made later. I need to obtain computers/software for the PCW, BBC, Coupe, QL, Acom & Einstein + I need to see how the readership grows over the next few months.

Dear Martyn

I was wondering if you might have a possible solution to a problem that is creeping up on me. For a while now I find the glare of my monitor screen is affecting my eyes. This makes it difficult to concentrate on tasks like word processing for any length of time. This is due to a worsening eye problem.

Yours, A Hopkins

Ed. You are not the only one with this type of problem. Another member in Cornwall has had to give up trying to use his 464. So perhaps I can help two people at once here! First of all, turn down the glare on the monitor by twiddling with the Contrast knob. Then if that doesn't quite help, why not pop to your local computer shop and pick up an anti-glare screen. They do not cost much and you should be able to fix them to the monitor easily enough - and it will help reduce eye strain and headaches.

## WRITING LETTERS:

Letters can be about any subject - whether it be a question on the group, a problem or comment. Letters can be as a printout, or submitted on Amiga or PC disc in DD or HD formats.



# Intro to Z80

## For any Z80 based micro. Article written by Dez

All home-computers are equipped to operate using a high level computer language such as BASIC or FORTH, and these languages are designed to make program design as quick and easy as possible. With most high level languages the programmer uses words that are virtually plain English, and the computer's built-in software then converts these into machine code routines that the microprocessor at the heart of the computer can interpret and act upon. Writing programs direct in machine code is, on the face of it, rather pointless, as it is somewhat harder and a considerably slower process than using BASIC or another high level language to achieve the same ends.

The advantage of machine code programs is the speed with which they run. The speed of a machine code program is only limited by the operating speed of the computer's microprocessor, and a computer can perform no faster than when it is running a machine code program. High level languages such as BASIC are inevitably much slower due to the way in which each instruction has to be executed. In other words, the program is stored in memory in its BASIC form, and it is only when the program is run that each instruction is converted into machine code and executed. The program is effectively brought to halt during the interpreting process, which accounts for more time than the running of the interpreted machine code. The difference in speed is probably much greater than most people realise, and machine code is typically something approaching one thousand times faster than an equivalent BASIC program.

Action games written in BASIC are often a little sluggish due to this lack of operating speed, especially when a lot starts to happen at once, but a machine code equivalent normally appears to operate instantly no matter how much simultaneous action take place. With some scientific and business programs BASIC is too slow to be of any use at all, and the use of machine code is mandatory. However, the speed of machine code is its only advantage, and apart (perhaps) from the fun of it, there is no point in using machine code where a program written in a high level language would be fast enough.

There are alternatives to machine code and high level interpreted languages such as BASIC, and we will consider these briefly before moving on to a description of the microprocessor itself. Some high level languages are compiled rather than interpreted. The difference is that with a compiled language the



interpreting process is carried out before the program is run. The program may then run using the compiled machine code, or using a sort of pseudo machine code, which requires a minimal amount of interpreting. In either case programs should run at high speed, and should be far easier to write than equivalent machine code programs. A compiled language may seem like the ideal solution (and many people would argue that it is), but languages of this type are generally much more difficult to use than interpreted languages when writing and debugging programs, and languages such as BASIC are probably much better for beginners to programming. A mixture of BASIC and machine code (with the latter only being used where high operating speed is essential) can therefore be a more practical solution in many cases.

Incidentally, you may come across the terms source code and object code occasionally. The former is the program in its high level language form, and the latter is the machine code or pseudo machine code produced after interpretation or compilation.

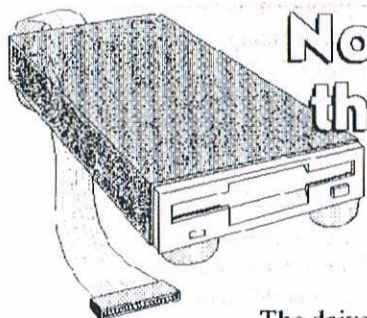
#### Assembly Language

The terms machine code and assembly language seem to cause a certain amount of confusion, and there seems to be a general belief that they are very similar, but there is an important difference. When machine code programming an 8-bit microprocessor the instructions for the microprocessor are in the form of numbers from 0 to 255 (or in some cases two numbers of this type). This is not a very convenient way of doing things, and it inevitably involves almost constantly looking up instructions to find their code numbers. Assembly language uses a program in the computer to take three or four letter codes and convert these into the corresponding machine code instruction numbers. Most assemblers also provide the programmer with some further assistance, but not much when compared to a high level language such as BASIC. The main function of the assembler is simply to take the appropriate numbers. An assembler is really the most basic of compilers, but as far as the programmer is concerned there is no real difference between assembly language and machine code, and if you can program in one you can also program using the other.

Of course, the main advantage of using an assembler is that the mnemonics are chosen to closely relate to the instructions that they represent. If you intend to do a lot of machine code programming and assembler could reasonably be considered essential, since using anything other than a few short machine code routines is generally rather awkward and inconvenient with most home-computers which are designed primarily for BASIC programming. A few computers (the Memotech MTX500 and

*Continued on page 24*





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NTX512 for instance) have built-in assemblers, but assembler programs are readily available for most other Z80 based computers. The facilities offered vary somewhat from one assembler to another, but most give at least some aid with debugging, although they are nothing like as sophisticated as the best BASIC languages in this respect.

A high level language like BASIC varies only slightly from one computer to another; and once mastered it is usually not too difficult to write programs for other computers. Problems can arise with the sound and graphics facilities, due to variations in the sound and graphics commands. Machine code programming is identical for any computers that use the Z80A microprocessor as the central processor. Although there are again differences in the sound and graphics facilities available on various machines, these do not affect the instructions that are available to the programmer (although different routines per computer may be necessary).

The situation is very different when dealing with a computer that uses a different microprocessor such as the 6502. Apart from the differences in the sound and graphics facilities, the instruction sets & registers of various microprocessors are substantially different. Although microprocessors work on the same basic principle, rewriting machine code to run on different machines is a substantial amount of work involving different mnemonics, code numbers etc.

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# Classic add-on

## RAM Music Machine

cassette £49.99 / disc £69.99

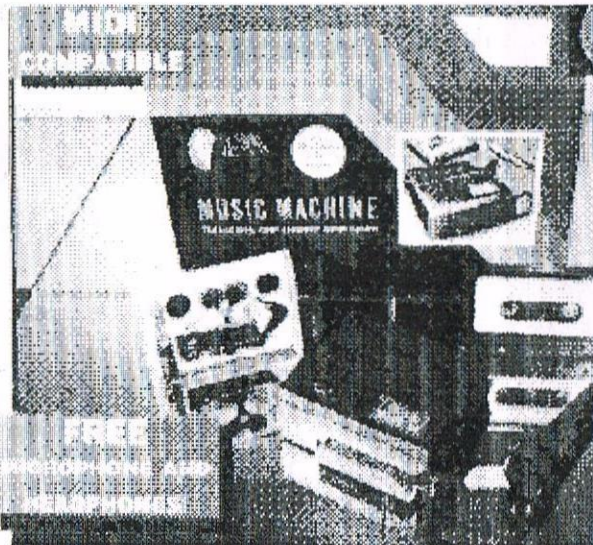
Second hand prices - £20 / £30  
respectively



One of the best ever music devices packaged by Datel Electronics in 1989. Setting up the equipment was quick and simple and consideration was given to the beginner with clear instructions in the manual. The only annoyance was that the MIDI ports were not labelled (where's my letraset?). Once everything was connected, the program soon loaded up from disc and the main menu was well presented for accessing all the modules of the system. With a MIDI keyboard, the first option to go for is.... yes, you've guessed it, MIDI! From here you define which of the 16 channels receive and transmit data. Play the keyboards own sounds, any resident sample, or even the Music Machines own pre-sampled drum beats. Sound outputs can be directed to the Music Machines earphone or phono sockets - or if you are really desperate, or if applicable - use the micro's own internal speakers (ughh!).

### Taking A Sample

The Music Machine is quite capable of doing a decent job at taking and editing sound samples. Of course it may not be in the same league as the Casio FZ-1 or the E-mu Emulators 2 and 3, but at least you don't have to break the bank with Datel's product. However, unless you own some pretty expensive gear you will never be able to sample sounds and reproduce them to the same quality as the built in percussion sounds. After all,





you get what you pay for. But all things considering - it isn't too bad. A factor in all of this is the memory limitations which affects the quality and duration. With the RMM the maximum duration is 1.22 seconds. The best option is to sample drums but some other instruments come out ok.

### Writing a masterpiece

To be perfectly honest, the music editor is going to frustrate anyone with a good knowledge of music. This is essentially for the beginner considering that the maximum number of notes you can play is two - and only if you have a MIDI keyboard attached. It is really a step-time sequencer. The drum editor is different though. This works in a very similar fashion to professional drum machines, and for this alone it makes the

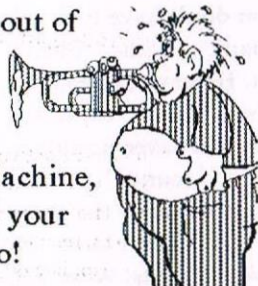
RMM a good piece of kit. So if you are a budding Stuart Copeland (aka The police) then the RMM will provide eight samples: cowbell, snare, hi-tom, lo-tom, open hi-hat, closed hi-hat and bass. They have been superbly sampled and make the RMM drum capabilities excellent value for money.

### Conclusion

Overall very good for its price making it one of the cheapest MIDI interfaces built for the 8 bit user. An enthusiasts plaything, but drum features are of a professional standard. Foundation's Sequencer and DHCP's 8-track sequencer will work with the RMM (CPC) - Protracker on the Spectrum - or any good music sampler according to the 8 bit computer you are using.



Take the strain out of creating that music master piece by using the Ram Music Machine, a keyboard and your trusty micro!





# 6502 BASIC

## PROGRAMMING YOUR JOYSTICK

One difference of commercial games and home grown software is the provision of a joystick option. There will be two different programs listed here one for Electron and the other for BBC/Acorn computers. This followed by some hardware information.

This first program only works with the BBC. After typing in this first section you should see a gun sight represented by a "+" sign. Don't forget to SAVE on a regular basis.

```
20 DIM(2),U(2)
25 U(1)=680:U(2)=512
30 *TU255,1
60 MODE1
70 VDU23;8202;0,0,0;
100 GCOL3,3
110 VDU5
115 MOVE 680;512:PRINT"+ "
120 PROCUPDATE(1)
130 U(1)=1280-U(1)
140 PROCUPDATE(2)
160 MOVE U(1),U(2):PRINT"+ "
170 MOVE U(1),U(2):PRINT"+ "
220 GOTO 120
230 DEF PROCUPDATE(P)
240 U(2)=U(1)
250 U(P)=(ADVAL(P))/(53+13*((P+1)
MOD 2))+20
260 ENDP
```

At the start of the listing there are two DIMensioned arrays. This is for storing the current and last position of the gun sight. Line 30 prepares the screen for the game and selects the mode on line 60.

Line 70 is used to switch off the cursor

During animation, the cursor is blanked out by the use of OR set up on line 100. This so that areas of overlapping white graphics will disappear. Line 110 uses VDU5 to PRINT at the graphics cursor and GCOL to colour the text characters.

PROCUPDATE is the method of dealing with inputs from the joystick. Acorn joysticks come as a pair using an Analogue to Digital converter - and the value in the converter is returned by ADVAL. ADVAL(1) reads the horizontal value, ADVAL(2) reads the vertical position, ADVAL (3)/ADVAL (4) read the horizontal and vertical positions of joystick two. Each can return a value from 0 to 65520 in steps of 16.

PROCUPDATE works with either ADVAL(1) or (2) and the value of P is passed from PROCEDURE calls in lines 120 & 140. To move the gun sight to a new position line 240 swaps either the vertical or horizontal values of V2 for the corresponding element in V. The coordinates are calculated by line 250 and when dealing with ADVAL(1) line 130 alters the new value of V(1)

With the new calculation worked out, line 160 blanks out the old cursor position and line 170 is for re-plotting for a second time. Line 220 is a temporary measure for creating a loop for continual movement of the gun sight.

### ELECTRON / ACORN

Electron computers have no joystick socket. Instead an interface is needed in order for joysticks to be used. The



following program is for use with the First Byte joystick interface which allows connection of any Atari joystick.

```

5 DV=32
20 DIMV(2),V2(2)
25 V(1)=680:V(2)=512
30 *TV255,1
60 MODE1
70 VDU23;8202;0,0,0;
100 GCOL3,3
110 VDU5
115 MOVE 680;512:PRINT"+ "
120 PROCUPDATE(1)
130 V(1)=1280-V(1)
140 PROCUPDATE(2)
160 MOVE V2(1),V(2):PRINT"+ "
170 MOVE V(1),V(2):PRINT"+ "
220 GOTO 120
230 DEF PROCUPDATE
232 V2(1)=V(1):V2(2)=V(2)
240 V=255-?&FCC0
242 IF V AND 1 THEN V(2)=
V(2)+DV
244 IF V AND 2 THEN V(2)=
V(2)-DV
246 IF V AND 4 THEN V(1)=
V(1)-DV
248 IF V AND 8 THEN (V2)=
V(1)+DV
250 IF V(1) < 0 OR V(1) > 1240 THEN
V(1)=V2(1)
255 IF V(2) < 0 OR V(2) > 1000 THEN
V(2)=V2(2)
260 ENDPROC

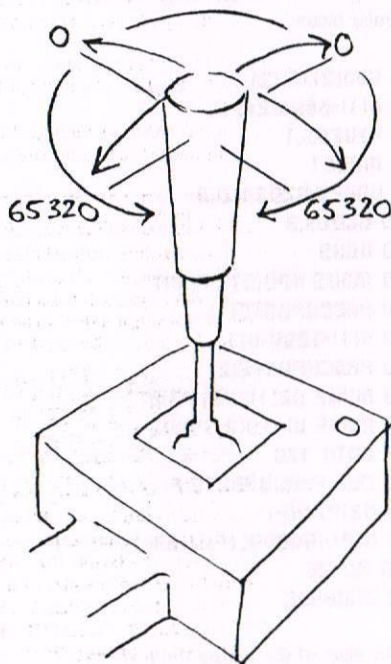
```

As you will see there are similarities throughout the program as per the BBC version. At line 5 DV is used to move the gunsight every 32 pixels, hence is set at 32. Line 232 swaps the values in the current position array-V- into the last position array-V2. The value being taken from the joystick port is handled on

line 240. It's subtracted from 255 to make the testing in lines 242 to 248 much easier.

The checks look for bits set by the signals from the joystick. When the joystick is pushed up, line 242 tests for bit zero. When pushed down, line 244 tests for bit one. Lines 246 and 248 test for bits two and three (left and right movements).

Lines 250 and 255 make sure adjustments by previous lines don't send the cursor off the screen. If they have, then the previous position is put back into the current position array.



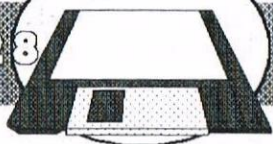
*Each of the potentiometers returns a value in the range of 0 to 65320.*



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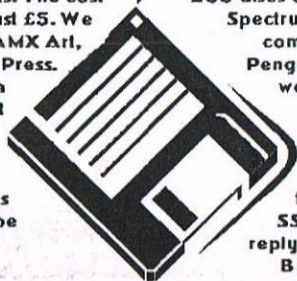
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Xerox A4 copy paper 90g. 500 sheets. Ideal for copiers, high speed copiers, laser printers, inkjets and offset presses. £8.99 Code: VK-48-p

Fax Rolls. Bright white paper for crisp clear printing. Won't jam or stick. Wrapped to keep out dust. £4.99 per roll. Code: VK-89-r

Thinkjet, Quietjet, Quietjet plus. Hewlett Packard inkjet cartridges £14. Code: VK-91-j  
MPS1270 ink cartridge £14. Code: VK-91-mps

Cannon BC01 £22. BC02 £23.50. BC1-10 £15. BC1-11 £17.50. BC1-11(black) £15. BC20 £28. BC121BK £9.99. BC121C £18.99. BJ101 £11.99

Black cartridge for Epson Stylus 300/400/800/800+/1000 £14

Star LC10 black or colour £9.99  
LC24 10/15/20 black or colour £12  
LC100/200 black £8.99

All prices include VAT and p/p. Payable to "M. Sherwood".



Press items should be sent to the Editor  
at: 13 Rodney Close, Bilton,  
Rugby, Warwickshire CV22 7HJ



More news  
reaching the  
hotline!

# STOP PRESS

## Snippets of 8 bit news

- (1) **CRASHED** is revamped: Long running Spectrum magazine is revamped by Dave Fountain - the new editor. The mag is designed on a Spectrum with the odd techy bit, retro games & demo reviews. The cost is £1 for 20 A4 pages. **WARNING:** the magazine has a tendency to use strong language and vulgar expressions. Cash or uncrossed PO's to: D Fountain, 11 Camel Road, London E16 2ED.
- (2) The **UAUG** for CPC users has relaunched it's book club with a revised list. Also, the tape library has been passed over to Leon Brown of Galaxy Software. See issue 74 for details (£1.70 payable to M Sherwood): **UAUG** 13 Rodney Close, Bilton, Rugby CV22 7HJ.
- (3) **Quazar Surround** sound card is still available for the **SAM Coupe**. It costs £53.99 payable to C. Piggott at: 204 Lammond Drive, St Andrews, Fife KY16 8RR Tel: 01334 475546.

### NEXT ISSUE: August 1999 #2

With pop group **Blondie** back in action after 16 years, the **UAUG** does its own 'Phoenix from the flames' with news of the re-emergence of classic software for 464 users. Our editor meanwhile is busy dusting down his **Blondie** collection!

#### Missing any issues of "6502-Z80"?

If your issue does not arrive during the month specified on the back page, then contact the editor. Please allow time for us to be reimbursed by Royal Mail - and your magazine will be posted with the following issue.